

**Near Miss Investigation
Accident Prevention Analysis Program**



65th Street Incident

June 5, 2008

Prepared By:

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Sacramento Metropolitan Fire District

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OVERVIEW OF INCIDENT

On June 5, 2008 at 1230 hrs Sacramento Metro and Sacramento City fire crews responded to a commercial fire in south Sacramento County. The incident involved an 8000 square foot commercial structure that was well involved upon arrival. Several crews initiated fire attack operations on the interior, while a single three person truck company was preparing to start ventilation operations on the roof. At approximately 1244 hrs, 9 minutes after the first company arrived on the scene, there was a total catastrophic failure of the open web truss system while crews were working both above and below the fire. Interior crews were able to evacuate the structure without aid, while the truck company required rescue by ground ladders. A "MAYDAY" was called by the Incident Commander and a PAR was conducted. No crews were injured and the incident was classified as a "NEAR MISS"

INVESTIGATIVE SUMMARY

At approximately 1700 hrs the same day, Chief Walter White of the Sacramento Metro Fire District Training/Safety Division contacted the on duty Safety Officer and requested that a formal investigation be conducted into the incident. On duty Safety Officer Captain Scott Clough organized an investigation team consisting of Captain Mike Teague Investigation coordinator, Captain Scott Clough Lead Investigator, and Battalion Chief Kyle Johnson Assistant Investigator.

The incident scene was photographed by Captain Clough. Metro Fire investigators excavated the site and recovered the tools used by Truck 10. Diagrams and inspection records were gathered from Metro Fire's Fire Prevention Bureau.

Interviews were conducted with BC4, BC2, and all members of Truck 10 that evening. An interview was conducted with the first arriving company officer the following morning. Interviews were conducted with the remaining crews of the first alarm assignment over the next four shifts. A total of fifteen crew members were interviewed. Some members were not available for interviews as they were deployed on other assignments out of the County. The interviews consisted of a standard set of questions. Responses were recorded by hand written notes.

BUILDING INFORMATION

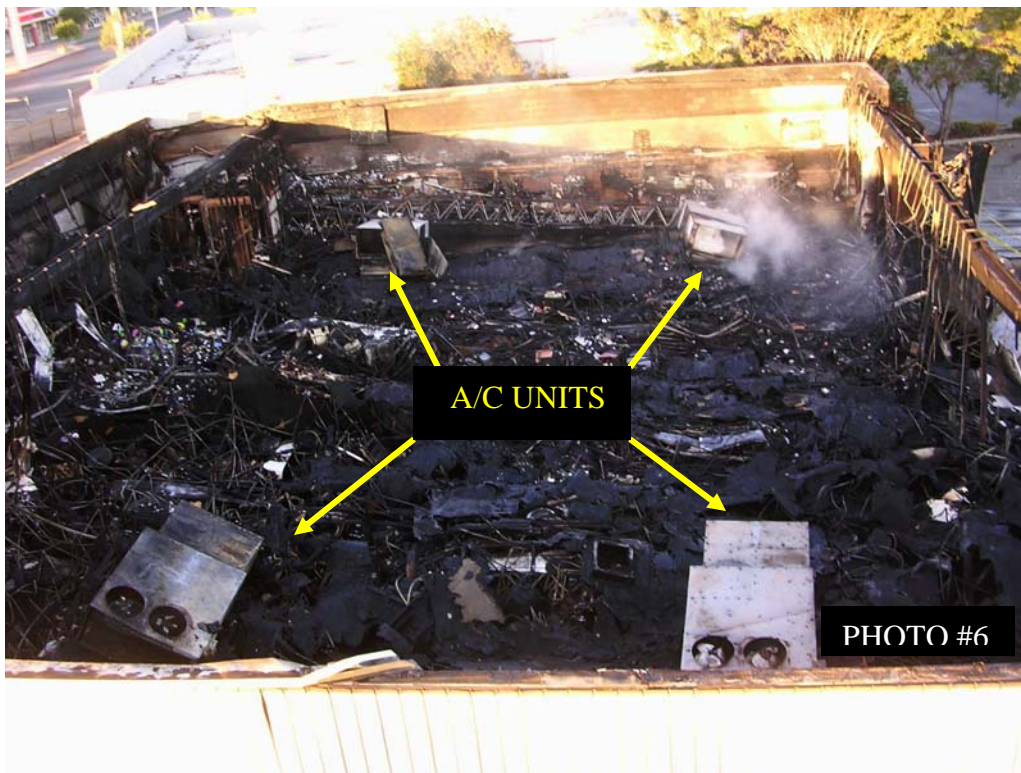
NFPA identifies this building as type III construction. Type III construction typically consists of exterior walls of masonry construction or material that meets the fire rating. Interior structural members including walls, columns, beams, floors, and roofs are permitted to be partially or wholly combustible. The building was constructed in 1973 and measured 80'x100' and approximately 8000 square feet [See Diagram #1]. The building was not protected by fire sprinklers nor was the open web trusses protected by any resistive coating. The walls were constructed of masonry blocks and had a four hour fire rating. The main roof was supported by unprotected pitched open web trusses consisting of a 2x4

wooden top cord, a 2x4 wooden bottom cord, and 1 inch tubular steel members provided the structural support. The trusses were spaced 2-feet on center and were covered by ½ inch plywood with composition roll roofing on top. These trusses are often referred to as TJL, JLX, and TJW trusses. (See Photo #1, #2)



The interior of the building had a single laminated beam running from the “Bravo” side to the “Delta” side of the structure supported by 6 inch steel posts. The beam was positioned 19’ from the “Charlie” wall. (See Photo #3, #4) This area to the rear had an independent truss assembly to support the rear of the roof, while the main truss assembly ran from the inside laminated beam to the header located at the front of the store. Extending past the glass front windows was a mansard that was supported from the front header to a smaller header that was supported by two walls extending past the front of the building. (See Photo #5) Atop the roof sat four commercial A/C units with an estimated weight of 1100 lbs each. *Note; the reported weight of the A/C units was provided by Buetler Heating and Air-conditioning Sacramento. Company Engineers estimated the weight based on photographic documentation and the age of the building.* It is undetermined if these units were supported in anyway from below. (See Photo #6) The business was operating as a supplier and manufacturer of products for the cosmetic nail industry. The business was permitted to have no more than 1600 gallons of flammable liquids on site. The business owner told Arson Investigators that he had in excess of 1000 gallons of flammable liquids consisting of acetone, polish remover, liquid monomer, and 70% alcohol, on site at the time of the fire.





INVESTIGATION

On June 5, 2008 Sacramento Metro and Sacramento City fire fighters responded to a commercial structure fire. While engaged in fire ground operation the roof suddenly collapsed resulting in a near miss for 10 firefighters.

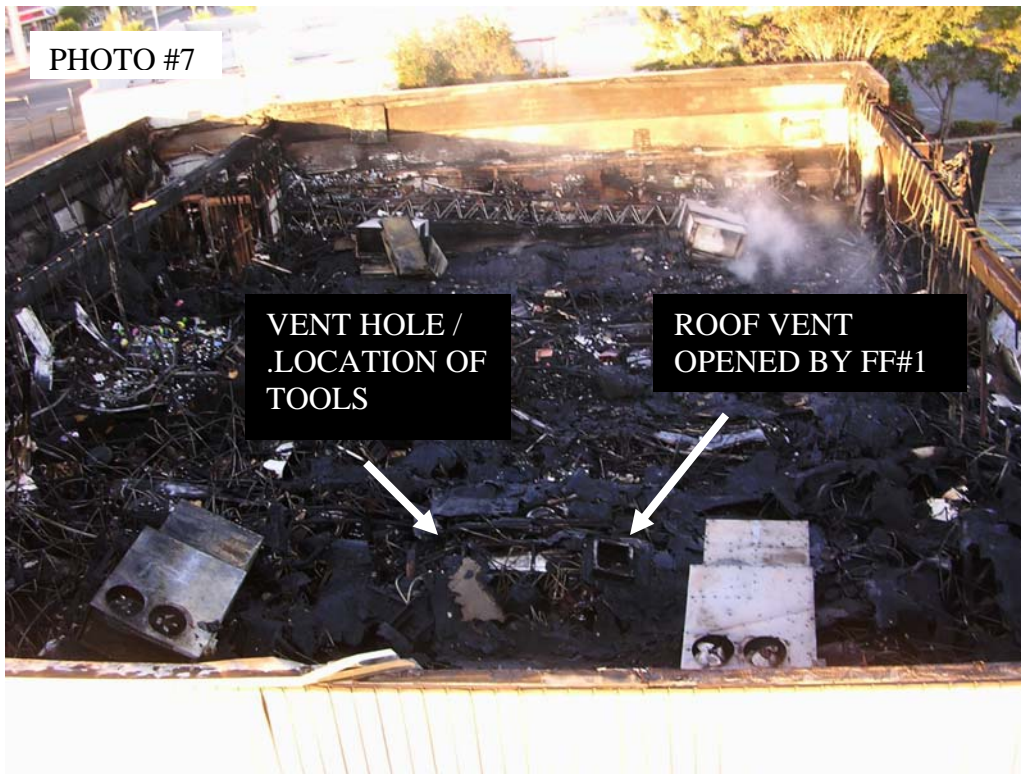
At 1230 hrs the Sacramento Regional Fire/EMS Communication Center "SRFECC" received a 911 call reporting a business on fire. This was followed by several additional calls within minutes. A first alarm commercial assignment consisting of two BC's, two truck companies, three engines, and a medic unit was dispatched at 1230 hrs. Roll call was conducted by BC9 on the assigned radio tactical channel. Truck 10 responded and announced that they had a crew of three. E53 and M53 arrived together at 1235 hrs. Captain 53 reported that he had a single story commercial structure with heavy smoke and fire through the roof. He assigned M53 as "two-out" and directed them to pull a back up line and assist with interior fire attack upon arrival of the second engine. He then requested the second engine to secure a water supply. Captain 53 then assumed Interior. *Note; Captain 53 told investigators that he was surprised at the amount and intensity of the smoke so early in the fire, and stated that he thought this was probably going to be a defensive fire. However, he wanted to give it one good shot to try to save the business.* FF53 pulled a 1 ¾ inch hand line and advanced it to the front of the structure and prepared to initiate interior operations. *Note; FF53 told investigators that he knew he should have pulled a 2 ½ inch line but said that he did not think that he and his Captain would have the mobility to advance the line effectively in the structure.* Captain 53 stated that

upon entering the structure there was moderate heat and no visible flames, but they encountered heavy smoke conditions. He stated that they were approximately six feet inside the structure and visibility was near zero. He then utilized the TIC to assess the ceiling area and found heavy fire and heat conditions overhead. M53 pulled a single 2 ½ line and upon arrival of the second engine entered the structure to assist with fire attack. *Note; M53's change from "two-out" to interior fire suppression was never announced to Command.* At approximately six feet inside the structure, and slightly to the left of the door, M53 made contact with E53. Captain 53, now Interior, informed the crews that there was significant fire overhead. Water was played into the area in short bursts (penciling) with no change in fire conditions. Lines were then opened up in an attempt to gain control of the fire. *Note; Captain 53 told investigators that there was no change in the conditions overhead with heavy application of water, but did not report this to anyone. Interior did however inform the immediate crews that there was significant fire overhead and ordered them to not advance any further into the structure.*

While Interior operations were beginning to take place, T10 arrived six minutes after initial dispatch. Upon their arrival they stated that they were unable to gain access with the truck as the driveway was blocked by hose. T10 laddered the roof with a 24 foot ladder on the "Bravo" side of the structure near the B/C corner of the building. T10 crew stated that they accessed the roof and did not see any fire through the roof. Crew members stated that they saw smoke coming from the vents and lighting off. FF#2 sounded the roof, and all members

said they felt the roof was solid. FF#2 from T10 continued to sound the roof and identified what he thought was a beam. As he continued to sound the roof, crew members made their way along the "Bravo" wall towards the middle of the roof.

Note; the crew told investigators they felt they had identified the supporting beams and purlins and that the roof was solid. At a point near the middle of the roof, between two large A/C units, the crew made their way out on the roof towards the "Delta" side of the building. At a point approximately 12 feet out from the "Bravo" wall they made their first cut. FF#2 cut a 4'x 4' hole while FF#1 sounded the roof around him. The roof covering was pulled back, and an attempt to louver the cut was unsuccessful. They then rolled the roof material back and found little smoke coming from the hole. *Note; at the time the hole was cut, video footage from the fire scene shows large amounts of smoke coming from the location where T10 was operating.* FF#1 then pulled a vent cover off and had significant smoke from the vent. (See Photo #7)



Note; neither T10 Captain, nor E53 Captain ever reported their conditions to each other or to Command. However, E56 Captain identifying himself as Interior later reported the conditions to IC.

E56 and E57 arrived together seven minutes and thirty seconds after initial dispatch. Although E56 arrived ahead of E57, E56 worked on water supply and E57 assumed Command. E56 crew members stated that upon arrival they saw heavy smoke boiling out the front of the structure. FF#1 described what he called “extreme fire conditions” *Note; E56 Engineer told investigators that he saw heavy “ugly” smoke and that things didn’t look right. He thought this was going to be a defensive fire.* FF’s from E56 then prepared for forcible entry but determined that it wasn’t needed. The crew then entered the structure to support interior operations. E56 crew met up with M53 on the 2 ½ inch line. They

determined they had an attic fire and attempted to pull ceiling but their hooks were too short, once longer hooks were retrieved they began to pull ceiling. FF#3 from E56 stated that he did not find any fire above them and wanted to advance the line towards the rear of the structure. M53 FF stated that he informed the FF from E56 that there was heavy fire above them and they were directed to not go any further into the structure. E56 FF#3 stated that he never heard a report on the conditions above him but stated that he did not find fire above and wanted to advance the line further to the rear. FF#3 from E56 took the line from M53 FF and stated that he advanced the 2 ½ inch line by himself another 5 feet into the structure. *Note; this exchange between the two fire fighters, although short in duration, delayed the advancement of the 2 ½ inch line further into the structure. Within moments of this exchange the roof collapsed.* While this was taking place E57 crew entered the building and began assisting with fire attack. E57 Captain who assumed Command took a look at three sides of the building. Captain 57 stated that he did not see any fire, but had significant grey smoke coming down and blowing across 65th Pkwy. He stated that at this time he was not sure if operations should remain offensive or go defensive but knew he had a significant fire. Approximately 30 seconds after Captain 57 assumed Command and started his size up BC4 arrived on scene and assumed Command from E57 Captain. E57 Captain proceeded to the front of the structure at the point of entry and made contact with the captain from E56. *Note; Captain 57 told investigators that he did not feel comfortable with the change of command between himself and BC4. He stated that he would have liked to have had a face-to-face in order*

to pass on the information he had. Captain 56 asked Captain 57 if the building had vented. Captain 57 stated that he couldn't see due to the smoke and stepped back and walked around a car toward the A/B corner when he heard a "swoosh"

BC4 arrived 8 minutes after initial dispatch (estimated as he did not mark on scene). Upon arrival he positioned on 65th street and assumed 65th Street Command. T16 was directed to the "Charlie" side of the structure. T16 announced on the tactical channel that they were going to the C/D side and were going to set up to go defensive. BC4 stated that he had dark black/grey smoke that was lying across the roadway. He also stated that he heard a report that there were three occupants inside and only two got out. BC4 stated that he felt there was no possibility of survivors based on the conditions. *Note; BC4 told investigators that upon his arrival he estimated that at least 50% of the structure was already involved, and 80-90% within a few minutes of his arrival. He thought "get on it quick or it's going big". He further stated that he was unclear why T10 was going to the roof if it already had vented.* BC4 stated that he never received a report on conditions from Interior or T10. However, audio tapes revealed that a report on conditions was given by E56 and was acknowledged by IC.

At 1237 hrs, while enroute to the incident BC9 called a second alarm. Utilities were requested and CHP was requested to expedite due to smoke on the roadway.

BC9 arrived at 1240 hrs. BC9 met up with BC4 and they moved the Command Post down the street out of the smoke. BC9 stated that upon his arrival there was thick brown smoke pushing out of the front of the structure under pressure, that he further described as "boiling". He estimated the involvement at 25% and described it as a well seated fire. At this time BC4 and BC9 established a joint command.

1244 hrs BC2 arrived as part of the second alarm assignment. As he approached the scene he stated that there was heavy smoke from the front, and fire through the roof. He estimated the involvement at 50% but said he wasn't really sure. *Note; BC2 told investigators, he thought "if we don't get this handled in 5-10 minutes we go defensive, there was too much pressurized smoke coming out that was dark."* At this time crews working inside the structure stated that conditions began to deteriorate rapidly. Several crew members stated that the smoke started to move with velocity, and that temperatures increased rapidly. At approximately 1245 hrs Interior crews stated that they heard or felt a loud concussion and they were being hit with falling debris. At this time all interior crews rapidly exited the building. While interior crews were evacuating, T10 was beginning to make a second cut on the roof. One FF described what he felt as a "subtle shift" another described a "sick feeling in his stomach" another said he felt movement under his feet. The Captain yelled "run!!" FF#2 yelled "collapse!!" T10 crew threw their tools down and ran to the "Bravo" wall. They describe that they felt the roof dropping and they were running "up hill" all three members jumped to the "Bravo" parapet wall and climbed on top. They remained on top of

the wall until ground ladders could be placed in a position that they could climb down.

At this time BC4 stated that he called "MAYDAY" when he saw T10 running across the roof and realized the roof was giving way. BC4 immediately began giving directions to crews on the scene to initiate rescue operations and locations for the rescues. BC2 switched to a Command channel and requested three Code-3 Medic units. Once the rescue was completed on the roof, BC4 initiated a PAR. *note; BC4 told investigators he was unaware that M53 was working interior, and that he did not have a RIC in place or a rescue plan prior to the collapse of the roof.* After all crew members were accounted for, Command initiated defensive operations on the fire ground.

CONCLUSIONS

The structural collapse at 6960 65th Street occurred 14 minutes 44 seconds after the initial 911 call was received, and 9 minutes 44 seconds after the first unit arrived on scene. The collapse was the result of direct and intense flame impingement on the unprotected open web trusses supporting the roof. The fire was accelerated by the storage of flammable liquids, primarily acetone, which was estimated at more than 1000 gallons. The cause of the fire is undetermined at this time.

1. The Near Miss component of the incident was the result of numerous factors both direct and casual that influenced the outcome.
2. First arriving Company Officers failed to recognize key factors that indicated the severity of the fire. Time of day, color and intensity of smoke, the pressure behind the smoke, and the volume of fire already present were not fully appreciated.
3. Fire fighters were allowed to initiate operations such as line selection, placement, and advancement that should have been better controlled by their Company Officers.
4. Company Officers initiated operations based on SOG's or SOP's but did not validate those operations with information on conditions from other crews.
5. Updates on conditions and progress were not verbalized by crews to command that could have lead to changes in the operational strategies of the incident.
6. Many first alarm officers and crew members upon their arrival felt that the fire was probably a defensive operation, but did not mention these concerns to other members.
7. The rapid rate of failure and the interaction of some crew members on hose lines may have contributed to the positive outcome, as crews did not have enough time to advance further out on the roof

or deeper into the building. However, it was in fact the rapid rate of failure that caused the near miss.

DISCUSSION

From 1998 through 2008 a total of 29 fire fighters have been killed in the United States as a result of truss failure. It should be noted that this incident occurred less than one year after the Charleston NC incident that resulted in nine firefighter fatalities. The danger is so severe that NIOSH has issued a NIOSH ALERT titled “**Preventing Injuries and Deaths of Fire fighters Due to Truss System Failures**” In this alert; NIOSH recommends that the following steps be taken:

Fire Departments:

- Ø Ensure that fire fighters are trained to recognize and identify floor and roof truss systems
- Ø Conduct pre-incident planning and inspection to identify buildings that contain truss construction
- Ø Share information with other departments who provide mutual aid response in the same area
- Ø Inspect buildings under construction to identify truss construction

- Ø Develop and implement standard operating procedures (SOPs) to combat fires safely in buildings with trusses
- Ø Modify existing work practices where necessary to ensure safety when working around trussed buildings
- Ø Use defensive strategies where trusses have been exposed to fire or structural integrity cannot be verified. (Unless life saving operations are under way), evacuate fire fighters and use exterior attack [Brannigan 1999; Dunn 2001]
- Ø Ensure that the Incident Commander conducts an initial size-up and risk assessment before beginning interior operation
- Ø Consider using a Thermal Imaging Camera as part of the initial size to locate fires in concealed spaces
- Ø Continually size-up and analyze risk vs. gain during the incident [Dunn 1998]
- Ø Pay close attention to conditions outside the structure, monitor the roof and compare to interior operations [Dunn 1996; NIOSH 1999]
- Ø Immediately notify RIC as soon as truss construction had been identified

- Ø Evacuate fire fighters from above and below trusses as soon as it is determined that the trusses have been exposed to fire (not according to a time limit)
- Ø Establish collapse zones as truss roof collapses can push on walls causing secondary collapse of the exterior walls [Brannigan 1999; Klaene and Sanders 2000; NIOSH 1999]

Company Officers/Fire Fighters

- Ø Use extreme caution when working on or around truss systems
- Ø Notify Incident Command as soon as truss construction has been identified
- Ø Communicate interior conditions to the Incident Commander as soon as possible and provide regular updates
- Ø Use defensive strategy once burning of truss members is identified
- Ø EXPECT imminent collapse once lightweight truss roofs or floors are involved in fire [Klaene and Sanders 2000]
- Ø Avoid roof areas loaded by air conditioning units, air handlers, or other heavy objects
- Ø Be aware of and plane alternative exit routes at all times when working above or below a truss

- Ø Immediately open ceilings and other concealed spaces whenever a fire is suspected in a truss system

- Ø Be aware of the nearest exit and of the other fire fighters working around you

RECOMMENDATIONS

- ❖ Have all Company Officers, Chief Officers, and potential Incident Commanders familiarize themselves with the International Association of Fire Chiefs “Ten Rules of Engagement for Structural Firefighting and the Acceptability of Risk” [See Appendix A]
- ❖ Train firefighting personnel to recognize the signs of deep seated, oxygen starved fire. Turbulent, boiling smoke is indicative of impending flashover. Survivability profile of a victim is zero.
- ❖ Ensure Incident Commanders are basing strategic decisions on risk vs. gain.
- ❖ Establish and maintain communications between interior and exterior crews and Command. It is critical Command is kept updated with CAN reports.
- ❖ Develop and advocate a county wide Truss Identification placard system for all commercial buildings. [See Appendix B]
- ❖ Countywide program be implemented requiring Fire Prevention personnel, and Company Officers forward the addresses of all known commercial buildings with Truss roofs, and floors to Fire Dispatch so a Premise History can be entered into CAD
- ❖ Have all Operations Personnel view “The Art of Reading Smoke” [Dodson]
- ❖ Implement and enforce the Countywide RIC program
- ❖ Require multi-agency Command Training for all Sacramento County Fire agencies

Appendix A

San Francisco Fire Code Section of Truss Roof Markings

5.05 Signage of Buildings with Wood or Lightweight Steel Truss, or Composite Wood Joist (TJI) or Roof Construction

Reference: 2007 San Francisco Fire Code Section 507.3.2

Buildings with wood or lightweight steel truss or composite wood joist (TJI) floor and/or roof construction present a greater hazard to firefighters than buildings with traditional roof and floor construction, due to the increased incidence of early collapse during fires. Firefighting in San Francisco requires an aggressive approach due to the proximity of buildings. For these reasons, the Fire Department is requiring that any building with wood or lightweight steel truss floor and/or roof construction, whether existing or new, be posted with a sign identifying it as such.

Exception: Group R, Division 3 Occupancies

For existing buildings where conventional sawn wood joists are replaced with trusses, the building shall be identified as above when:

1. Spaced at 24"- 2 or more are replaced, or;
2. Spaced at 16"- 3 or more are replaced.

The emblem shall be of a bright and reflective color, or be made of a reflective material. The placard shall be an isosceles triangular shape and the minimum size shall be 12 inches horizontally by six inches vertically. The following letters, of a color to make them conspicuous, shall be printed on the emblem and shall be a minimum size of 2-1/4 inches tall:

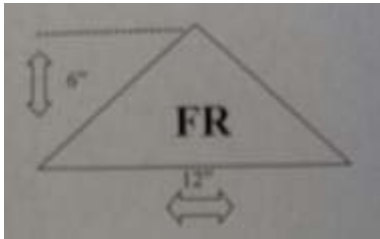
- i. "F" to signify a floor with truss construction;
- ii. "R" to signify a roof with truss construction;
- iii. "FR" to signify a building with both floor and roof truss construction.

Larger placards are permitted and their size shall increase proportionally to the specifications above. The emblem shall be permanently affixed to the left of the main entrance door between four and six feet above the landing, and shall be maintained by the owner of the building. Alternative locations may be approved by the Fire Marshal. Multiple signs may be required at the discretion of the Fire Marshal when multiple entrances to the building exist. The sign shall

be suitable and durable for exterior use and its method of attachment to the building shall be of a permanent nature.

Exception: In high-rise buildings, the sign may be located in the Fire Control Room.

Example of a sign identifying a building with truss floor and roof construction.



Appendix B

Incident Timeline

123016 hrs Initial 911 call received

123031 hrs Dispatch of first alarm assignment
BC9, BC4, E53, M53, E57, E56, TR10, TR16, METROAC

123516 hrs E53/M53 arrives, reports heavy smoke with fire through the roof.
E53 assume Interior, M53 is assigned two-out

123619 hrs T10 arrives and reports they are “all out” and going to the roof

123742 hrs E56 arrives and begins to secure water supply. M53 enters the structure, E56 crew assists with interior operations

123749 hrs BC9 orders a second alarm while enroute

123759 hrs Dispatch second alarm assignment
BC2, E10, E51, E50, TR50, R21

123800 hrs E57 arrives and assumes Command. E57 crew enters the structure to assist with fire attack

123900 hrs BC4 arrives and assumes 65th Street Command

124000 hrs TR16 arrives and positions to the rear of the structure reports they are setting up to go defensive

124123 hrs BC9 arrives moves Command Post west of the incident and joins BC4 with command

124403 hrs BC2 arrives and begins to make his way to the CP

124500 hrs Estimated time of roof collapse based on radio transmissions

124520 hrs MAYDAY called by IC

124535 hrs BC9 contacts Fire Dispatch and requests three additional medics

124538 hrs BC2 contacts Fire Dispatch and requests three additional medics

Total time of collapse incident from time of Dispatch to estimated collapse 14 minutes 44 seconds

Total time of collapse incident from arrival of first company to collapse 9 minutes 44 seconds

Total time of collapse incident from arrival of Truck 10 to collapse 8 minutes 41 seconds

EXAMPLE LANGUAGE FOR A LAW REQUIRING LABELING OF BUILDINGS FOR THE FIRE SERVICE

This sample language is based on recommendations in the National Institute for Occupational Safety and Health (NIOSH) report entitled “NIOSH Alert: Preventing Injuries and Deaths of Firefighters due to Truss System Failures.” The report states:

“Consider placing building construction information outside the building. Include information about roof and floor type...”¹

The NIOSH report also recommends as part of pre-fire planning to:

Record data regarding roof and floor construction (e.g., wooden joist, wood truss, steel joist, steel truss, beam and girder, etc.) [NFPA 2003].²

The sample language below provides building labeling that identifies the building’s construction type, is simple yet logical, and should allow firefighters to quickly know the building’s floor and roof construction materials, promoting better and more complete information on the fireground and increased firefighter safety.

xxx Identification of structural construction. Structural construction types shall be identified by a sign or signs, such as that shown in Figure 1, in accordance with the provisions of this section.

xxx.1 Signs. Signs shall be affixed where a building or a portion thereof is classified as Group A, B, E, F, H, I, M, R-1, R-2, R-4 or S occupancy. The owner of the building shall be responsible for the installation of the sign.



Figure 1

xxx.2 New buildings and buildings being added to. Signs shall be provided in newly constructed buildings and in existing buildings where an addition that extends or increases the floor area of the building. Signs shall be affixed prior to the issuance of a certificate of occupancy or a certificate of compliance.

xxx.3 Existing buildings. Signs shall be provided in existing buildings. Signs shall be affixed within ninety days of being notified in writing by the Code Enforcement Official.

xxx.4 Contents of signs. Signs shall consist of a diagram (see Figure 1) 6 inches (152.4 mm) in height and width, with a stroke width of ¼ inch (6.4 mm). The sign background shall be reflective white in color. The diagram and contents shall be reflective red in color, conforming to Pantone matching system (PMS) #187. Where a sign is directly applied to a door or sidelight, it may be a permanent non-fading sticker or decal. Signs not directly applied to doors or sidelights shall be of sturdy, non-fading, weather resistant material.

¹ National Institute for Occupational Safety and Health, “NIOSH Alert: Preventing Injuries and Deaths of Fire Fighters due to Truss System Failures,” p. 10.

² Ibid., p. 8.

xxx.5 Identification of construction classification. Signs shall contain the roman alphanumeric designation of the construction classification of the building, in accordance with the provisions for the classification of types of construction (types I through V) of the building code. The roman numeral designating construction classification shall be 1 inch (25.4 mm) minimum in height and have a stroke width of ¼ inch (6.4 mm) minimum, and it shall be reflective white in color on a background of reflective red.

xxx.6 Identification of year of construction. Signs shall indicate the building's year of construction or major reconstruction. The arabic numeral indicating year of construction shall be 1 inch (25.4 mm) minimum in height and have a stroke width of ¼ inch (6.4 mm) minimum, and it shall be reflective white in color on a background of reflective red.

xxx.7 Identification of structural construction types. Signs shall contain the alphabetic designations identifying the structural construction types used in the building, as follows:

"W" shall mean sawn joist/rafter construction, wood members

"I" shall mean engineered I-joist construction, wood members

"S" shall mean steel construction

"T" shall mean truss type construction³

"C" shall mean concrete construction



Figure 2

The construction type of the building's floors shall be indicated by placing the appropriate designating letter or letters in the lower portion of the diagram, and the construction type of the building's roof shall be indicated by placing the appropriate designating letter in the upper portion of the diagram, as shown in Figure 2. The designating letters shall be 2 inches (50.8 mm) minimum in height and have a stroke width of ½ inch (12.7 mm) minimum.

xxx.8 Location. Signs shall be placed at each entry of the structure used by the general public for entrance. The sticker/decal shall be placed on the glazing on the leaf of the entrance door, or on its sidelights, where applicable. Where no such glazings exist at the entrance, an aluminum plaque backer shall be installed in the same region as that where a sidelight would be permitted. The sign shall be at least 42 inches above grade but less than 60 inches. When installed on other than the door leaf, the sign shall be applied to the glazing/plaque within 8 inches of the door leaf.

³ Truss type construction is defined as a fabricated structure of wood or steel, made up of a series of members connected at their ends to form a series of triangles to span a distance greater than would be possible with any of the individual members on their own. Truss type construction shall not include individual wind or seismic bracing components which form triangles when diagonally connected to the main structural system.

International Association of Fire Chiefs

The 10 Rules of Engagement for Structural Fire Fighting

and the Acceptability of Risk



**Prepared by the
ICHIEFS Health and Safety Committee
August, 2001**

ACCEPTABILITY OF RISK

All fire fighting and rescue operations involve an inherent level of risk to fire fighters.

- A basic level of risk is recognized and accepted, in a measured and controlled manner, in efforts that are routinely employed to save lives and property. *These risks are not acceptable in situations where there is no potential to save lives or property.*
- A higher level of risk is acceptable only in situations where there is a *realistic potential* to save known endangered lives. This elevated risk must be limited to operations that are *specifically directed toward rescue* and where there is a *realistic potential to save the person(s) known to be in danger.*

RULES OF ENGAGEMENT FOR STRUCTURAL FIREFIGHTING

All structural fire fighting operations involve an inherent level of risk to fire fighters. All feasible measures shall be taken to limit or avoid these risks through risk assessment, constant vigilance and the conscientious application of safety policies and procedures.

- The exposure of fire fighters to an elevated level of risk is acceptable only in situations where there is a realistic potential to save known endangered lives.
- *No property is worth the life of a fire fighter.*
- *No risk to the safety of fire fighters is acceptable in situations where there is no possibility to save lives or property.*
- Fire fighters shall not be committed to interior offensive fire fighting operations in abandoned or derelict buildings that are known or reasonably believed to be unoccupied.

RISK ASSESSMENT

It is the responsibility of the incident commander to evaluate the level of risk in every situation. This risk evaluation shall include an assessment of the presence, survivability and potential to rescue occupants. When there is no potential to save lives, firefighters shall not be committed to operations that present an elevated level of risk.

An incident command system shall be established, beginning with the arrival of the first fire department member at the scene of every incident. The incident commander must conduct an initial risk analysis to consider the risk to fire fighters in order to determine the strategy and tactics that will be employed.

The responsibility for risk assessment is a continuous process for the entire duration of each incident. The incident commander shall continually reevaluate conditions to determine if the level of risk has changed and a change in strategy or tactics is necessary. The incident commander shall assign one or more safety officers to monitor and evaluate conditions to support this risk analysis.

At a minimum the risk analysis for a structure fire shall consider:

Building Characteristics

- Construction type and size
- Structural condition
- Occupancy and contents

Fire Factors

- Location and extent of the fire
- Estimated time of involvement
- What are smoke conditions telling us?

Risk to Building Occupants

- Known or probable occupants
- Occupant survival assessment

Fire Fighting Capabilities

- Available resources
- Operational capabilities and limitation

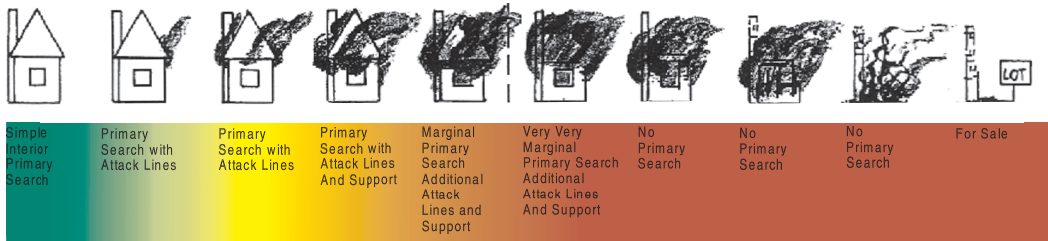
10 Rules of Engagement for Structural Fire Fighting

Acceptability of Risk

- 1 No building or property is worth the life of a fire fighter.
- 2 All interior fire fighting involves an inherent risk.
- 3 Some risk is acceptable, in a measured and controlled manner.
- 4 No level of risk is acceptable where there is no potential to save lives or savable property.
- 5 Fire fighters shall not be committed to interior offensive fire fighting operations in abandoned or derelict buildings.

Risk Assessment

- 1 All feasible measures shall be taken to limit or avoid risks through risk assessment by a qualified officer.
- 2 It is the responsibility of the Incident Commander to evaluate the level of risk in every situation.
- 3 Risk assessment is a continuous process for the entire duration of each incident.
- 4 If conditions change, and risk increases, change strategy and tactics.
- 5 No building or property is worth the life of a fire fighter.



Risk Assessment/Rules of Engagement			
Fire Fighter Injury/ Life Safety Risk	High Probability of Success	Marginal Probability of Success	Low Probability of Success
Low Risk	Initiate offensive operations. Continue to monitor risk factors.	Initiate offensive operations. Continue to monitor risk factors.	Initiate offensive operations. Continue to monitor risk factors.
Medium Risk	Initiate offensive operations. Continue to monitor risk factors. Employ all available risk control options.	Initiate offensive operations. Continue to monitor risk factors. Be prepared to go defensive if risk increases.	Do not initiate offensive operations. Reduce risk to fire fighters and actively pursue risk control options.
High Risk	Initiate offensive operations only with confirmation of realistic potential to save endangered lives.	Do not initiate offensive operations that will put fire fighters at risk for injury or fatality.	Initiate defensive operations only.